

### **REMARKS**

Claims 1-14 and 20-22 were at issue in this Office Action, and claims 15-19 were withdrawn from consideration. The present response cancels withdrawn claims 15-19 and does not add any new claims. Accordingly, it is now claims 1-14 and 20-22, as amended, which are at issue.

### **The Office Action**

In the Office Action mailed December 12, 2007, claims 1-14 and 20-22, all claims then at issue, were rejected. Claims 20 and 21 were rejected under 35 U.S.C. §112, first paragraph, as not being fully enabled in the specification.

Claims 1-4, 7 and 13 were rejected under 35 U.S.C. §102 as being anticipated by European Patent 0 411 547 of Seto. Claims 1 and 3 were rejected under 35 U.S.C. §102 as being anticipated by the publication of Mikkelsen.

Claims 5, 6, 8-10 and 22 were rejected under 35 U.S.C. §103 as being unpatentable over the European patent of Seto. Claim 9 was rejected under 35 U.S.C. §103 as being unpatentable over the Mikkelsen publication. Claims 1, 11, 12 and 14 were rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,686,198 of Kuo taken in view of the Seto European patent.

Insert: Claims 20 and 21 were rejected under 35 U.S.C. §112, first paragraph, as not being fully supported in the specification as originally filed.

Claims 11 and 12 were objected to as being in improper dependent form.

In addition, Figures 1, 3 and 4 were objected to.

Applicant thanks the Examiner for the Office Action, for the search, and for the thorough explanation of the basis of the rejections.

### **The Claim Objections**

Claims 11 and 12 were objected to under 37 CFR 1.75 as being in improper dependent form since, as the Examiner has noted, the claims as originally written were directed to a material having a particular porosity, while the application, at page 7, states that porosity is described with regard to the electrode. By the present amendment, claims 11 and 12 (as well as claim 1 and all other claims dependent thereupon) have now been revised to refer to an anode rather than a material. Therefore, these objections are now moot.

### **The Rejections under 35 U.S.C. §112**

Claims 20 and 21 were rejected under 35 U.S.C. §112, first paragraph, as not being enabled in the specification. As originally presented, these claims refer to a method of oxidizing a fuel in an SOFC wherein one step comprised applying a voltage to the SOFC so as to oxidize the fuel. As the Examiner has noted, in the operation of a fuel cell, oxidization of a fuel generates an electrical current; hence, in the Examiner's opinion, the original claim language is not supported in the specification. By the present amendment, Applicant has amended claim 20 to remove the reference to applying a voltage. Hence claim 20 and claim 21 now overcome this rejection.

Claims 11 and 12 were also rejected under 35 U.S.C. §112, first paragraph, for the reason discussed above with regard to the objection to dependency. Again, in view of the amendment made to claims 11 and 12, this rejection is overcome.

**The Rejections under 35 U.S.C. §102**

A. Claims 1-4, 7 and 13 were rejected under 35 U.S.C. §102 as being anticipated by the Seto patent. The Seto patent describes separators/interconnectors for use in high temperature electrical devices such as fuel cells. The conductive bodies of Seto are comprised of lanthanum chromite-based complex oxides (see abstract and page 4, lines 36-38). The Seto patent is notable insofar as it does not include any teaching or suggestion of the use of the presently claimed class of materials as anodes for high temperature solid oxide fuel cells.

The claims as now on file are specifically directed to an anode for a solid oxide fuel cell which incorporates the specifically denominated double perovskite oxide material of formula I. It should be noted that the recitation of an anode is a significant limitation and not an intended use and should be given patentable weight. The anodes of the fuel cell are subject to a range of considerations and limitations that are not necessarily the same as the considerations and limitations made for other components of the fuel cell. As Applicant detailed in the response to the Written Opinion of the International Searching Authority dated 3 August 2004 and of record in this case, such considerations may include for example electrochemical performance and catalytic properties under anodic conditions (see page 3, line 27 – page 4, line 2 of the present application), reduced carbon formation when using hydrocarbon fuels (see page 2, lines 11-13), degradation resistance (see page 4, lines 14-15) and porosity (see page 7, lines 20-23). Since anodes and other cell components (e.g. cathodes) are subject to different considerations, it is not necessarily the case that a good cathode or interconnect member would function as an anode. Indeed, as indicated on page 4, lines 33-34, it is surprising that the material of claim I is usable in both the anode and cathode of the fuel cell.

The Seto reference in no way describes the use of the specific lanthanum chromite material as an anode of the fuel cell. In fact, Seto very specifically teaches away from the claimed anode of the present invention by teaching instead of the use of anodes of  $\text{NiO/Zr}_2$  cermet as anode materials for solid oxide fuel cells (see page 5, line 7). One of skill in the art will appreciate that an interconnect member performs a different function in a fuel cell as compared to an anode. Therefore, the mere fact that a material can function as an interconnect in no way teaches or suggests that that same material would have utility as an anode. The Seto inventors themselves did not recognize any utility for lanthanum based materials as anodes in fuel cells and even though possessed of some such materials, fabricated fuel cells using  $\text{NiO/Zr}_2$  cermet materials instead.

In view of the foregoing, Applicant respectfully submits that the Seto patent not only does not show or suggest the anode materials of the present invention, it specifically teaches away from such anodes. Therefore, in view of the amendments to the claims and the remarks presented herein, Applicant respectfully submits that the rejections based upon Seto are overcome.

B. Claims 1 and 3 were rejected under 35 U.S.C. §102 as being anticipated by the publication of Mikkelsen. The Mikkelsen publication teaches the use of lanthanum strontium ferrite manganates (LSFM) in fuel cells and in oxygen separation membranes. Like Seto, Mikkelsen does not have any teaching of anodes, let alone anodes of the type claimed in the present invention. Mikkelsen is solely concerned with devices which operate in oxygen-rich environments that are typically found in relation to cathode or electrolyte use. For the reasons discussed above, the Mikkelsen publication does not show or suggest the use of Applicant's now

claimed anodes in any type of fuel cell structure. In view of the amendments and remarks presented herein, the rejections based upon Mikkelsen are overcome.

**The Rejections under 35 U.S.C. §103**

Claims 5, 6, 8-10 and 22 were rejected under 35 U.S.C. §103 as being unpatentable over Seto. As discussed above, Seto in no way shows or suggests that any lanthanum based perovskite materials have utility as anodes for fuel cells, and actually teaches away from the use of the presently claimed material for this purpose. In view of the present amendments and the remarks set forth above, these rejections are overcome.

Claim 9 was rejected under 35 U.S.C. §103 as being unpatentable over Mikkelsen. Applicant respectfully submits that for the reasons that claims 1 and 3 are novel and nonobvious over Mikkelsen, claim 9, which is dependent from claim 1, is likewise nonobvious. In view of the amendments and remarks made herein, this rejection is overcome.

Claims 1, 11, 12 and 14 were rejected under 35 U.S.C. §103 as being unpatentable over the combination of Seto and Kuo 5,686,198.

The Kuo patent teaches the use of lanthanide mixtures as being used in air electrodes (cathodes) (see for example abstract; column 7, line 65 and column 8, line 16). Not only does Kuo not teach or suggest an anode as claimed in claim 1 of the present application, Kuo positively teaches away from such anodes. As described in Kuo, fuel cell anodes are comprised of nickel-zirconia or cobalt-zirconia cermets (see column 9, lines 14-17). Thus, Kuo like Seto actually supports the novelty and nonobviousness of the present invention insofar as it shows and suggests that materials other than the specifically recited materials of claim 1 should be used as anodes for fuel cells.

Seto teaches the use of separators/interconnectors containing lanthanum chromite-based complex oxides while Kuo teaches of lanthanide mixtures as being used in air electrodes (cathodes). As detailed above, the considerations for one fuel cell component (e.g. cathodes) are very different from those of another fuel cell component (e.g. interconnectors). Therefore, a skilled person would not simply substitute separator materials of Seto for the cathode material of Kuo. Even if they did, neither Seto nor Kuo teach or suggest an anode or a functional layer of an anode which comprises a material of claim 1 of the present application. Indeed, as both Seto and Kuo teach, nickel-zirconia cermets or cobalt-zirconia cermets should be used as anodes of fuel cells. Therefore, a skilled person based upon reference to Seto and/or Kuo would fabricate fuel cells using their suggested cermet material, and would not use the anode materials of the present application. Therefore, the subject matter of the claims at issue is not obvious in view of any combination of Seto and Kuo.

#### The Drawings

Applicant submits herewith a corrected set of drawings for Figures 1, 3 and 4. These new drawings remove the objected to narrative text. This text has been incorporated into the specification.

#### The Claims

Claim 1 has been amended to recite "An anode for use in a solid oxide fuel cell ...." The basis for this amendment can be found in claims 13 and 14 as originally filed and on page 14, line 21 – page 15, line 19 of the specification, which describe the material defined in claim 1 as being a part of a multi-component anode.

Claims 2-21 have been amended to correspond with the amendment made to claim 1.

Claim 14 has been amended to recite "An assembly for use in a SOFC, said assembly including an anode as claimed in claim 1." The basis for this amendment can be found on page 14, line 32 – page 15, line 29 of the specification which describe a multi-layer structure including a current collector and various other component. Further support can be found on page 15, line 33 – page 16, line 15 which describe an SOFC element having various components, including an element 10 functioning as an anode.

Claim 20 was amended to recite "oxidizing said fuel in said SOFC." A person skilled in the art of fuel cells would derive this limitation from the general teachings of the description.

**Conclusion**

In view of the amendments and remarks presented herein, Applicant respectfully submits that all objections and rejections are overcome. The application is in condition for allowance. Any questions, comments or suggestions the Examiner may have which will place the application in still better condition for allowance should be directed to the undersigned attorney.

Dated:

Respectfully submitted,

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